(12) UK Patent Application (19) GB (11) 2 117 409 A

(21) Application No 8201715
(22) Date of filing 21 Jan 1982
(43) Application published
12 Oct 1983
(51) INT CL³
C22C 1/02
(52) Domestic classification
C7D 8A1 8A2 8A3 8E 8F 8H 8K 8M 8N 8R 8W 8Z12 8Z4 9A1C 9A1E
(56) Documents cited
GB A 2037815
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(58) Field of search
C7D
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(54) **An alloying additive for producing alloys of aluminium and a method of producing such an additive**

(57) The additive is produced by coating one or more alloying elements in particulate form with a layer of particulate aluminium such that each particle of the alloying element is at least substantially surrounded by the aluminium layer. Particular alloying elements used are Al, Fe, Mn, Cr, Ni, Ti, B, Cu, Si, Pb, Bi, Cd and Zr, and the additive may be produced by mixing the element with aluminium leafing flake together with a resin.

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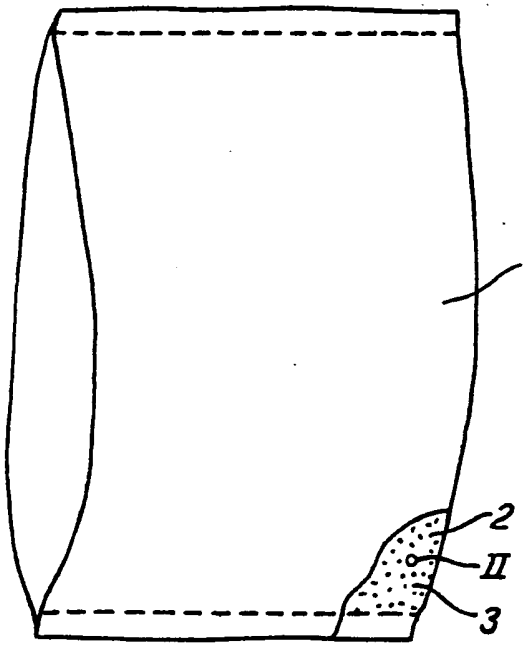

FIG.1

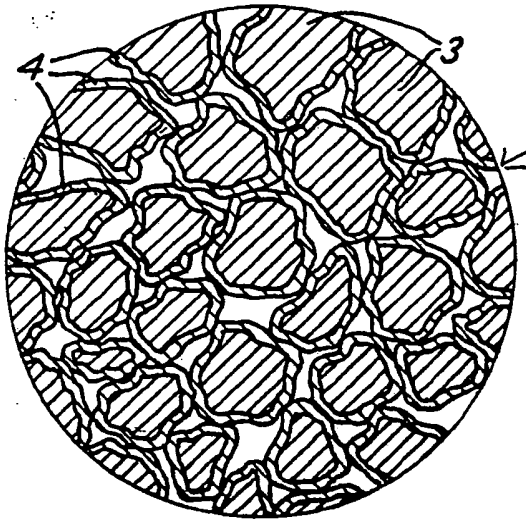

FIG.2

SPECIFICATION

An alloying additive for producing alloys of aluminium with other metals and a method of producing such an additive

This invention relates to an alloying additive for producing alloys of aluminium with other metals and to a method of producing such an alloying additive.

In the production of metal alloys, the necessary alloying elements are added to the molten base metal. However difficulties have occurred when producing alloys of non-ferrous metals because the alloying elements usually have a much higher melting point than the base metal with which they are to be alloyed and furthermore the alloying elements are often easily oxidisable so that a film of oxide is formed on the exterior of the alloying element. Thus the alloying operation is slowed down or is even prevented altogether.

Usually this problem is dealt with by adding to the base metal, not the alloying element as such, but ingots of so called hardener or master alloy. These hardener or master alloy ingots are constituted by alloying the elements to be alloyed in a relatively high percentage of metal which forms the base metal of the alloy. These ingots need to be specially produced and are relatively expensive since a relatively large amount of base metal has to be included and because of the high temperature necessary in order to produce melting of the components for producing the hardener or master alloys. In this way, when the hardener or master alloy is inserted into the molten base metal, the hardener or master alloy is diluted in the molten base metal so as to produce the desired alloy. It is necessary to ensure that the ingot of hardener or master alloy is properly immersed in the molten metal; it is often dropped in so that a crust or slag which has formed on the surface of the base metal is penetrated. If necessary the molten base metal can be agitated so as to assist the distribution of the material of the ingot until the ingot is fully melted and blended in with the base metal.

The present invention seeks to provide an alloying additive for producing alloys of aluminium, as base metal, and other metals, as additive, in which oxidation of the alloying elements is reduced substantially to zero and which provides an additive which is relatively inexpensive to produce as compared to hardener or master alloys previously used.

According to a first aspect of the invention, there is provided an alloying additive for producing alloys of aluminium comprising one or more alloying elements in particulate form, wherein each particle is at least substantially surrounded by a layer of particulate aluminium. Preferably the aluminium layer comprises aluminium leafing flake and a drier.

The particles of the alloying element(s) are smaller than 1/4 inch and the majority of the particles may desirably lie in the range of 1/8 inch to 200 mesh (BSS). Suitable alloying elements include manganese, iron, chromium, nickel, titanium, boron, copper, silicon, lead, bismuth, cadium and zirconium.

According to a second aspect of the invention, there is provided a method of producing an alloying additive for aluminium comprising coating one or more alloying elements in particulate form with a layer of particulate aluminium.

The alloying element(s) may suitably be coated with a paste of aluminium, resin and drier in a mill. Thus, if necessary, any grinding of the alloying elements to a suitable size may be undertaken.

The invention will now be described in greater detail by way of example, with reference to the drawings in which:—

Figure 1 is a view of a paper sack of alloying additive according to the invention, partially cut away, and

Figure 2 is an enlarged view of the circle as illustrated in Figure 1 and labelled II.

Referring to the drawings, Figure 1 shows a paper sack 1 which contains a form of alloying additive in accordance with the invention. As can be seen from the broken away portion of the bag, as indicated at 2 and, in particular, from enlarged part of this portion labelled I shown in Figure 2, the alloying additive consists of a large number of particles 3 of one or more of alloying elements, these particles being effectively covered by a layer 4 of particulate aluminium. As Figure 2 shows, each of the individual particles is substantially surrounded by the aluminium.

This construction of the alloying elements has the advantage that when alloying the additive is introduced into the molten metal base, the surrounding aluminium will be melted by the base aluminium, thus freeing the particles of the elements for intimate contact with the base aluminium without there being any opportunity for the particles to oxidise.

The aluminium layer suitably consists of ground or flaked aluminium formed into a paste, with a resin to provide adhesion, and a drier. In the course of the melting of the surrounding element, the oils in the drier will cause a turbulence in the melt and will assist in distribution of the alloying additive.

Furthermore it will be seen that the alloying additive consists of the alloying elements together with only a relatively small amount of the base metal i.e. aluminium, and furthermore, since the aluminium is not added to the alloying elements in the sense of producing an alloy, the melting point of the alloying elements is not relevant, nor in fact, is the melting point of the aluminium.

One method of producing an alloying additive in accordance with the invention will now be described. In this particular case, an alloying additive of manganese is considered.

Manganese powder or flake, which is the form in which this material is usually commercially available, is placed in a grinding mill, such as a

ball or rod mill together with an aluminium paste, a bonding resin and a drier. Where no further grinding is required, a paddle type mixer may be used for the mixing process instead. Suitably the aluminium paste is produced from standard leafing flake by grinding aluminium powder with stearic acid. The resin binder used comprises a reduced phenolic resin or hydrocarbon resin, raw wood oil, linseed oil, an aliphatic solvent for the resin, and an aromatic solvent to develop the characteristics of the aluminium leafing flake. A drier suitably comprise cobalt naphthenate. The mixing and or grinding of the materials has a result that each particle of the manganese is literally painted with aluminium paint leaving the manganese with a shiny aluminium colour. The material is then dried in trays, for example overnight, and bagged or otherwise packaged for transport and storage.

In a specific example of the production of manganese or additives, a suitable mix comprises:—

20kg Manganese powder of 100 mesh BSS,
500 gms aluminium leafing flake, and
200 gms resin and driers.

The above components are mixed in a mill or mixer for approximately 5 minutes and can then be discharged onto trays to dry.

Where paper sacks are used for storing the additive, these sacks will be burnt when the additive is added to the aluminium melt without any deleterous effect so that the sack of additive can be dumped straight into the base melt. Where metal cannisters are used, these must be of aluminium.

It will be understood that while the method described relates to the production of a manganese additive, it could equally well apply to other additives for and with aluminium. These additives may include one or more manganese, iron, chromium, nickel, titanium, boron, copper, silicon, lead, bismuth, cadmium and zirconium.

It will be appreciated that it is of particular importance that the alloying materials should be heavier than the aluminium melt to which they are applied so that they sink to the bottom of the melt having penetrated any slag or crust formed on the surface. It is undesirable for any of the alloying materials to remain floating on the surface since this will cause variation in the structure of the alloy when produced.

Different techniques are required for use with additives which are lighter than the aluminium melt. Furthermore, it will be understood that not only is the additive suitable for making alloys by addition to an aluminium melt but also for varying the constituents of an already existing alloy by addition of additional alloying elements or by varying the precentage ratio of the elements already present in the alloy. The number of alloying elements that can be used in a single solid additive can be varied depending upon the alloys to be produced with them. Alternatively the alloying additives may be restricted to a single alloying element and different types of additive may be used when more than one alloying element is to be added.

When alloying the base aluminium with the alloying element(s) in the alloying additives as previously described in the above embodiment, it is only necessary to know the amount of the melt whereupon the weight of additive material can be determined knowing the relative weight of the alloying elements and the aluminium paste. Actual weighing is not generally necessary since the alloying additives is supplied in preweighed amounts.

Form the above it will be seen that the invention makes possible for provision of an alloying additive which is adequately protected against oxidation and to a substantial degree against the action of water or water vapor, which is readily dispersed in a melt and which is of reduced cost due to ease of production and lack of any significant amounts of the aluminium metal, except as needed for producing the covering paste. Larger quantities of aluminium will of course be required where the additive is supplied in aluminium cannisters cannisters.

Claims (Filed on 24/1/83)

1. An alloying additive for producing alloys of aluminium comprising one or more alloying elements in particulate form, wherein each particle is at least substantially surrounded by a layer of particulate aluminium.

2. An additive as claimed in claim 1, wherein the aluminium layer comprises aluminium leafing flake and a drier.

3. An additive as claimed in claim 1 or 2, wherein the particles of the alloying element(s) are smaller than 1/4 inch.

4. An additive as claimed in claim 3, wherein the majority of the particles of the alloying element(s) lie in the range 1/8 inch to 200 inch (BSS).

5. An additive as claimed in any one of claims 1 to 4, wherein the alloying element(s) comprise one or more of manganese, iron, chromium, nickel, litanium, boron, copper, silicon, lead, bismuith, cadmium and zirconium.

6. A method of producing an alloying additive for aluminium comprising coating one or more alloying elements in particulate form with a layer of particulate aluminium.

7. A method as claimed in claim 6, wherein the particles of the alloying element(s) are coated with a paste of aluminium, a resin and a drier in a milt.

8. An alloying additive for producing alloys of aluminium substantially as described herein with reference to the drawings.

9. A method of producing an alloying additive for aluminium substantially as described herein with reference to the drawings.

Printed for Her Majesty's Stationery Office by the Courier Press, Leamington Spa, 1983. Published by the Patent Office, 25 Southampton Buildings, London, WC2A 1AY, from which copies may be obtained